



**UNITED STATES DEPARTMENT OF COMMERCE**  
**United States Patent and Trademark Office**

Address: COMMISSIONER OF PATENTS AND TRADEMARKS  
Washington, D.C. 20231

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.
-----------------	-------------	----------------------	---------------------

09/233,073 01/19/99 NANBU

K 033082W001

IM22/0411

SMITH GAMBRELL & RUSSELL  
BEVERIDGE DEGRANDI WEILACHER & YOUNG  
INTELLECTUAL PROPERTY GROUP  
1850 M STREET N W SUITE 800  
WASHINGTON DC 20036

EXAMINER

VINH, L

ART UNIT

PAPER NUMBER

1765

DATE MAILED:

04/11/01

**Please find below and/or attached an Office communication concerning this application or proceeding.**

**Commissioner of Patents and Trademarks**

# Office Action Summary

Application No.  
**09/233,073**

Applicant(s)  
**Kenichi Nanbu et al.**

Examiner  
**Lan Vinh**

Group Art Unit  
**1765**



☒ Responsive to communication(s) filed on 2/12/01

☐ This action is **FINAL**.

☐ Since this application is in condition for allowance except for formal matters, **prosecution as to the merits is closed** in accordance with the practice under *Ex parte Quayle*, 35 C.D. 11; 453 O.G. 213.

A shortened statutory period for response to this action is set to expire 3 month(s), or thirty days, whichever is longer, from the mailing date of this communication. Failure to respond within the period for response will cause the application to become abandoned. (35 U.S.C. § 133). Extensions of time may be obtained under the provisions of 37 CFR 1.136(a).

## Disposition of Claim

☒ Claim(s) 1-14 is/are pending in the applicat

Of the above, claim(s) \_\_\_\_\_ is/are withdrawn from consideration

☐ Claim(s) \_\_\_\_\_ is/are allowed.

☒ Claim(s) 1-14 is/are rejected.

☐ Claim(s) \_\_\_\_\_ is/are objected to.

☐ Claims \_\_\_\_\_ are subject to restriction or election requirement.

## Application Papers

☐ See the attached Notice of Draftsperson's Patent Drawing Review, PTO-948.

☐ The drawing(s) filed on \_\_\_\_\_ is/are objected to by the Examiner.

☐ The proposed drawing correction, filed on \_\_\_\_\_ is ☐ approved ☐ disapproved.

☐ The specification is objected to by the Examiner.

☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. § 119

☒ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d).

☒ All ☐ Some\* ☒ None of the CERTIFIED copies of the priority documents have been  
☐ received.

☒ received in Application No. (Series Code/Serial Number) 09/233,073.

☐ received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

\*Certified copies not received: \_\_\_\_\_

☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).

## Attachment(s)

☒ Notice of References Cited, PTO-892

☐ Information Disclosure Statement(s), PTO-1449, Paper No(s). \_\_\_\_\_

☐ Interview Summary, PTO-413

☐ Notice of Draftsperson's Patent Drawing Review, PTO-948

☐ Notice of Informal Patent Application, PTO-152

--- SEE OFFICE ACTION ON THE FOLLOWING PAGES ---

Art Unit: 1765

### DETAILED ACTION

1. The appeal brief filed on 2/12/2001 has been considered. However, the argument presented in the brief is mooted in view of the following new ground of rejection.

#### *Claim Rejections - 35 USC § 103*

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

3. Claims 1-6, 11-13 are rejected under 35 U.S.C 103(a) as being unpatentable over Collins et al. ( US 5,556,501 ) in view of Szwejkowski et al. ( US 5,338,398 ).

Regarding claims 1-3 of the instant claimed invention, Collins discloses an etching method using a plasma reactor chamber having an inductively coupled antenna driven by RF energy for etching metals, dielectric and semiconductor material. This etching method comprises the steps of:

supplying etching gas through a main gas inlet manifold into the internal vacuum processing chamber ( Col 7, lines 55-59 );

Art Unit: 1765

developing an etching plasma upon application of RF energy to the etching gas in the processing chamber ( col 7, lines 62-65 ) reads on a plasma producing step of producing radicals in the plasma producing chamber by converting the etching gas into a plasma by applying RF power to the etching gas

etching polysilicon on silicon wafer in the processing chamber 16B connected to the plasma source chamber 16A by flowing gas from the plasma source chamber downward toward the wafer located in the processing chamber ( Col 22 , lines 45-46 and Fig.1 and Col 8, lines 16-18 ), evacuating the processing chamber by a throttle valve ( Col 7, lines 39-41 );

supplying etching gas of Chlorine at a flow rate of 50cc to the processing chamber to etch polysilicon film ( Col 22, lines 45-48 ).

Regarding claim 2, Collins discloses that RF energy is supplied to the plasma source chamber using a coil for efficient inductive coupling ( Col 8, lines 4-14 ).

Regarding claims 11-13, Collins discloses using total chamber pressure of about 0.1mTorr to 200mTorr for etching ( col 9, lines 40-41 ), the pressure range of about 0.1mTorr to 200mTorr overlaps the claimed range of 5-10 mTorr

Collins differs from the instant claimed invention as per claim 1 by supplying etching gas of Chlorine at a flow rate of 50cc instead of an etching gas supply rate of 8.4 sccm or above for a substantial volume of one liter of the processing chamber as claimed in the instant invention.

Szwejkowski discloses a process for the RIE etching a polysilicon film on a silicon wafer in a vacuum etch chamber using Chlorine etching gas at a rate of from about 40 to about 100 sccm

Art Unit: 1765

into a 3 liter vacuum processing chamber ( 40 sccm/ 3liter= 13.3 sccm/liter within the range of 8.4 sccm to 16.9 sccm for a substantially volume of one liter ) ( Col 4, lines 19-22 ).

Szwejkowski also discloses that the pressure inside the vacuum chamber may range from about 10mTorr -100mTorr ( col 3, lines 33-34 )

Hence, one skilled in the art would have found it obvious to modify Collins's etching gas flow rates by using the etching gas flow rate as taught by Szwejkowski because Szwejkowski states that using the gaseous component and flow rate of his invention will not result in the undesirable formation of particles on the wafer surface and will not condense at room temperature in the lines used to bring the etchant gases to the vacuum etch chamber ( Col 5, lines 49-54 ).

4. Claims 7-10, 14 are rejected under 35 U.S.C 103(a) as being unpatentable over Collins et al. ( US 5,556,501 ) in view of Szwejkowski et al. ( US 5,338,398 ) and further in view of van Os et al. ( US 5,792,272 ).

Collins and Szwejkowski have been described above in paragraph 3. Unlike the instant claimed invention as per claims 7-10, Collins and Szwejkowski do not disclose providing a flow rate of the etchant which produce a flow diverging position that is substantially at or internal to the outer periphery of an object ( wafer ) being etched.

van Os discloses a plasma etching method, which uses an inductively coupled plasma chamber at low pressure, comprises the step of flowing etchant (  $\text{CF}_4$  ) into the process chamber to produce flow diverging position at internal location to the outer periphery of the wafer ( col 4,

Art Unit: 1765

lines 3-20, fig. 6 shows etchant flow pattern diverges at positions that is internal to the outer periphery of wafer 24) reads on a flow of etchant is provided at a flow rate which produces a flow diverging position that is substantially at or internal to the outer periphery of an object ( wafer ) being etched.

One skilled in the art would have found it obvious to modify Collins and Szejewski by providing a flow rate of etchant to produce a flow diverging position with respect to the outer periphery of the wafer as per van Os in order to achieve uniform concentration of etchant and promote uniform etching across the wafer.

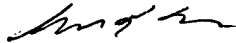
Regarding claim 14, Collins discloses using total chamber pressure of about 0.1mTorr to 200mTorr for etching ( col 9, lines 40-41 ), the pressure range of about 0.1mTorr to 200mTorr overlaps the claimed range of 5-10 mTorr

### *Conclusion*

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is (703) 305-6302. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech, can be reached on (703) 308-3836.

LV

April 8, 2001

  
BENJAMIN L. UTECH  
SUPERVISORY PATENT EXAMINER  
TECHNOLOGY CENTER 1700